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Nakamichi

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(54) **CONTAINER**

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This patent is subject to a terminal disclaimer.

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B65D 81/113 (2006.01)
B65D 85/30 (2006.01)

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CPC ***B65D 81/113*** (2013.01); ***B65D 85/30*** (2013.01)

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(Continued)

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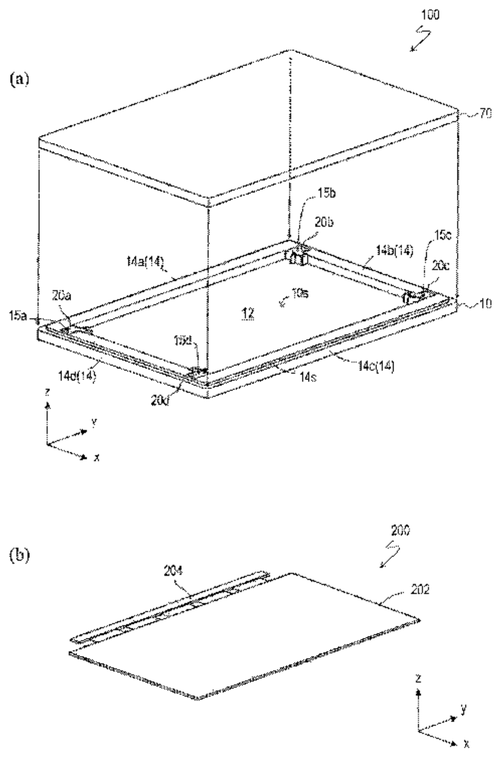
(57) **ABSTRACT**

A container (**100**) comprises: an accommodation member (**10**) that includes a base surface member (**12**) that defines a base surface of an accommodation space (**10***s*), and a side surface member (**14**) that defines a side surface of the accommodation space; and a protection member (**20***a*) that has a receiving surface that abuts an object to be accommodated. The side surface member (**14**) includes a cutaway section (**15***a*) that faces the accommodation space (**10***s*). The protection member (**20***a*) includes: an inner member (**22***a*) provided with a receiving section that has a receiving surface (**23**); and an outer member (**32***a*) disposed between the inner, member (**22***a*) and the side surface member (**14**) and fitting together with the inner member (**22***a*) so as to be able to slide in a direction that intersects the base surface. The inner member (**22***a*) and the outer member (**32***a*) of the protection member (**20***a*) are disposed in the cutaway section (**15***a*) so as to be independently attachable and detachable, and when the outer member (**32***a*) is removed, at least part of the inner member (**22***a*) can withdraw into a space where the outer member (**32***a*) was present.

9 Claims, 5 Drawing Sheets



(58) **Field of Classification Search**
CPC B65D 85/30; B65D 85/48; B65D 85/68; B65D 2585/6837; B65D 2585/058; B65D 71/04; H01L 21/67369; H01L 21/67363
USPC 206/586, 454, 453, 706, 723
See application file for complete search history.

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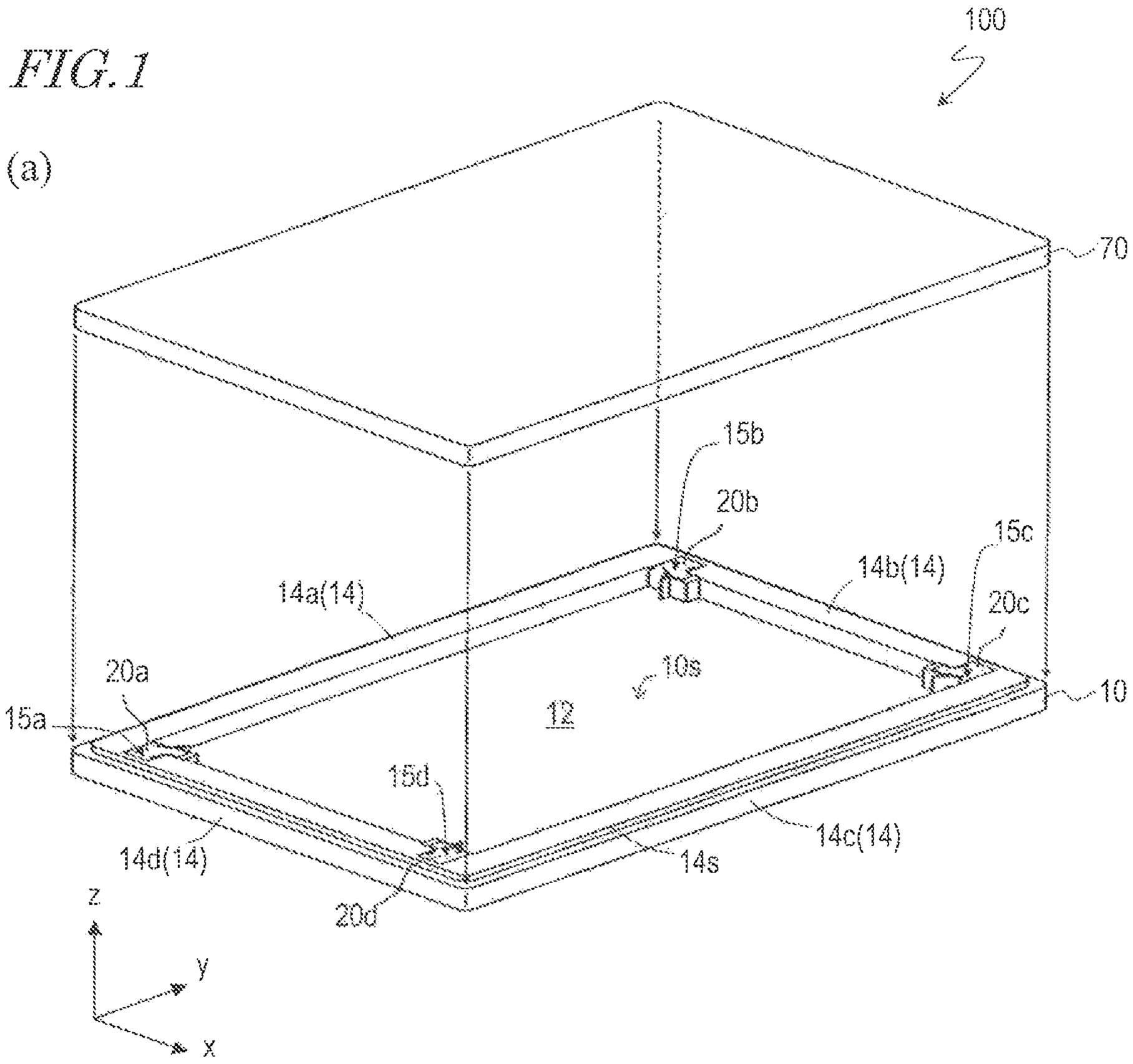
FIG. 1

(a)


100
70
15b
20b
15c
14b(14)
14a(14)
20c
20a
10s
10
15a
12
15d
14c(14)
14d(14)
14s
20d
z
y
x

(b)

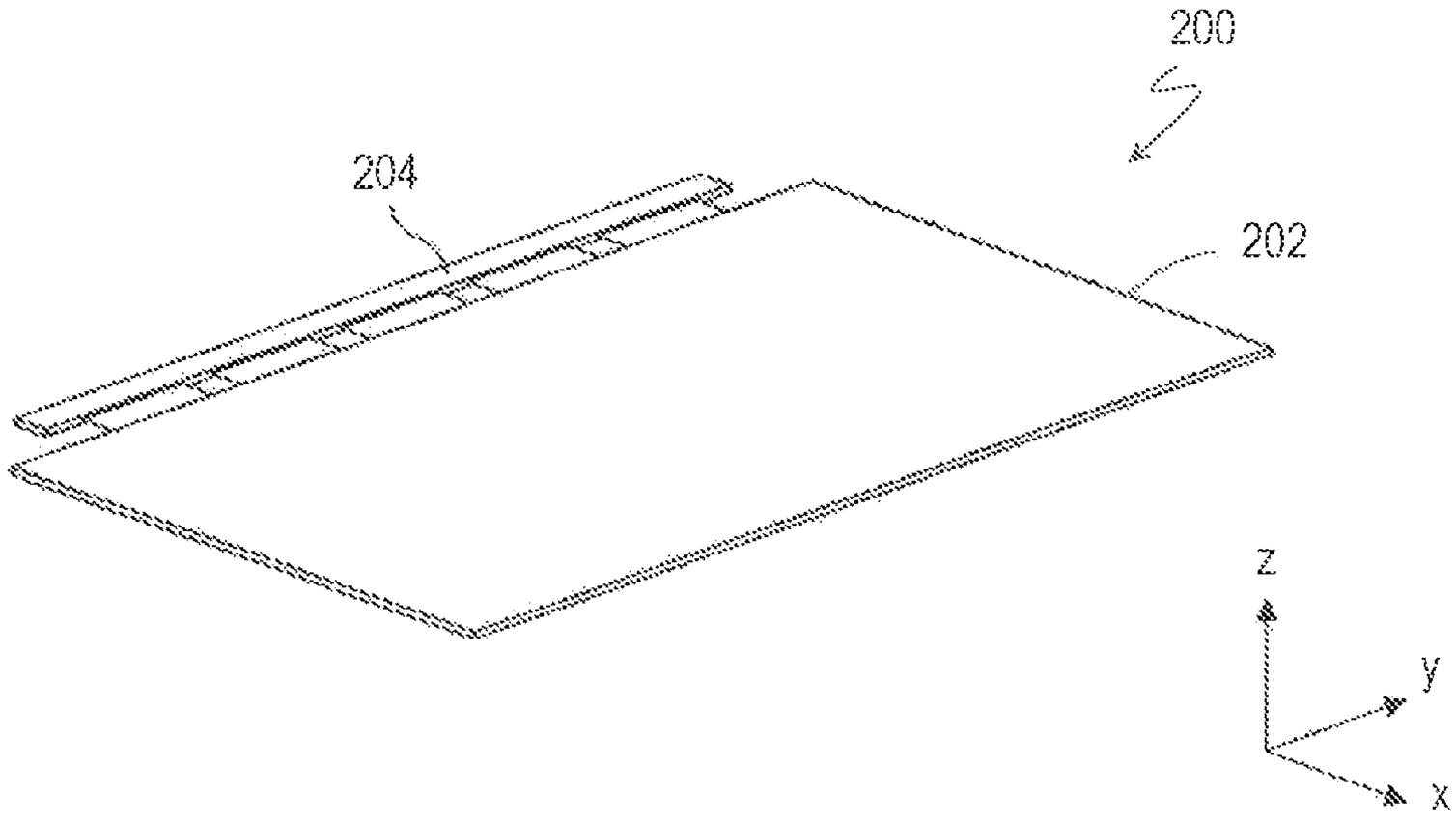
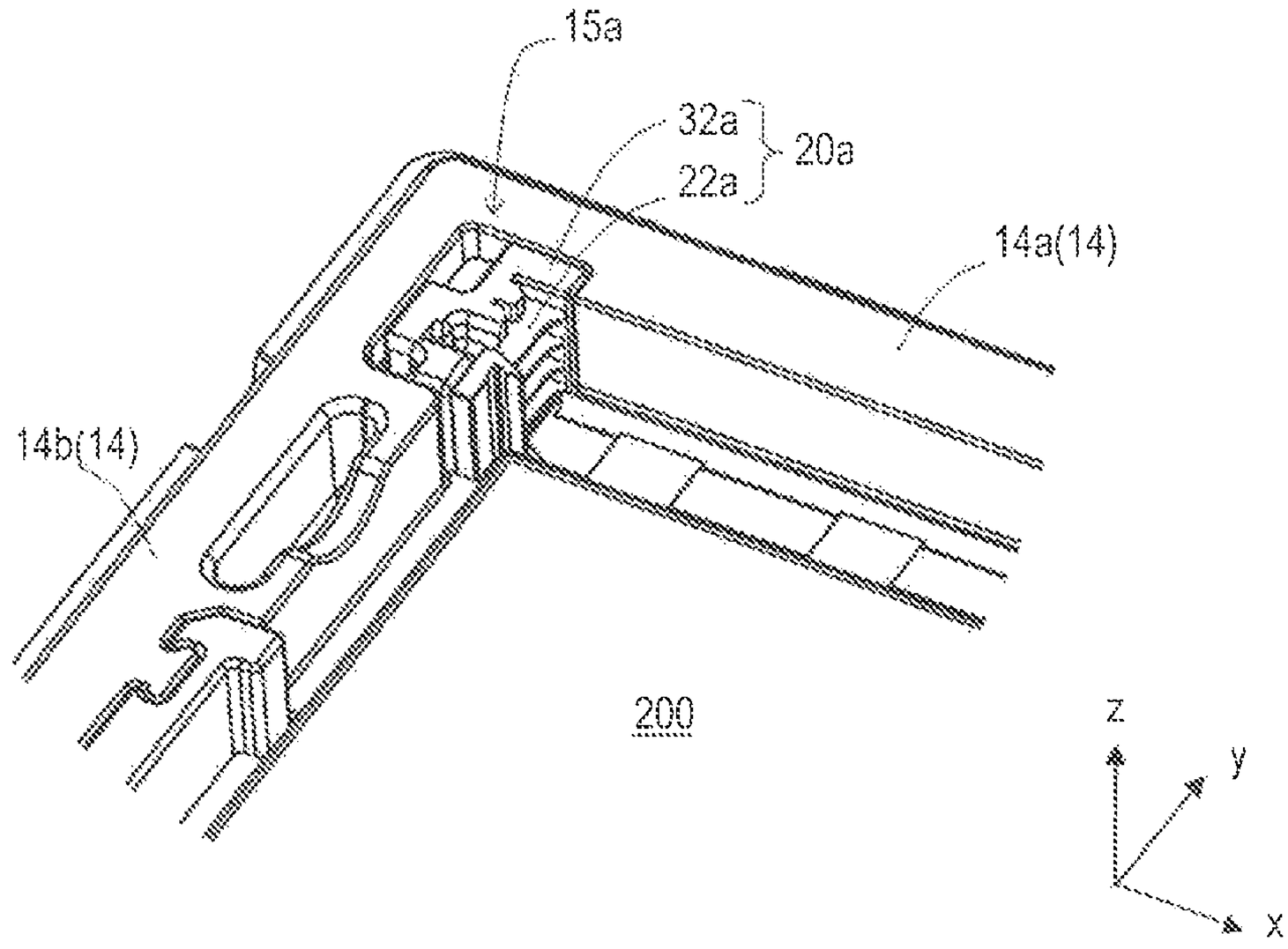

200
204
202
z
y
x

FIG. 2

(a)


15a
32a
20a
22a
14a(14)
14b(14)
200
z
y
x

32a

(b)

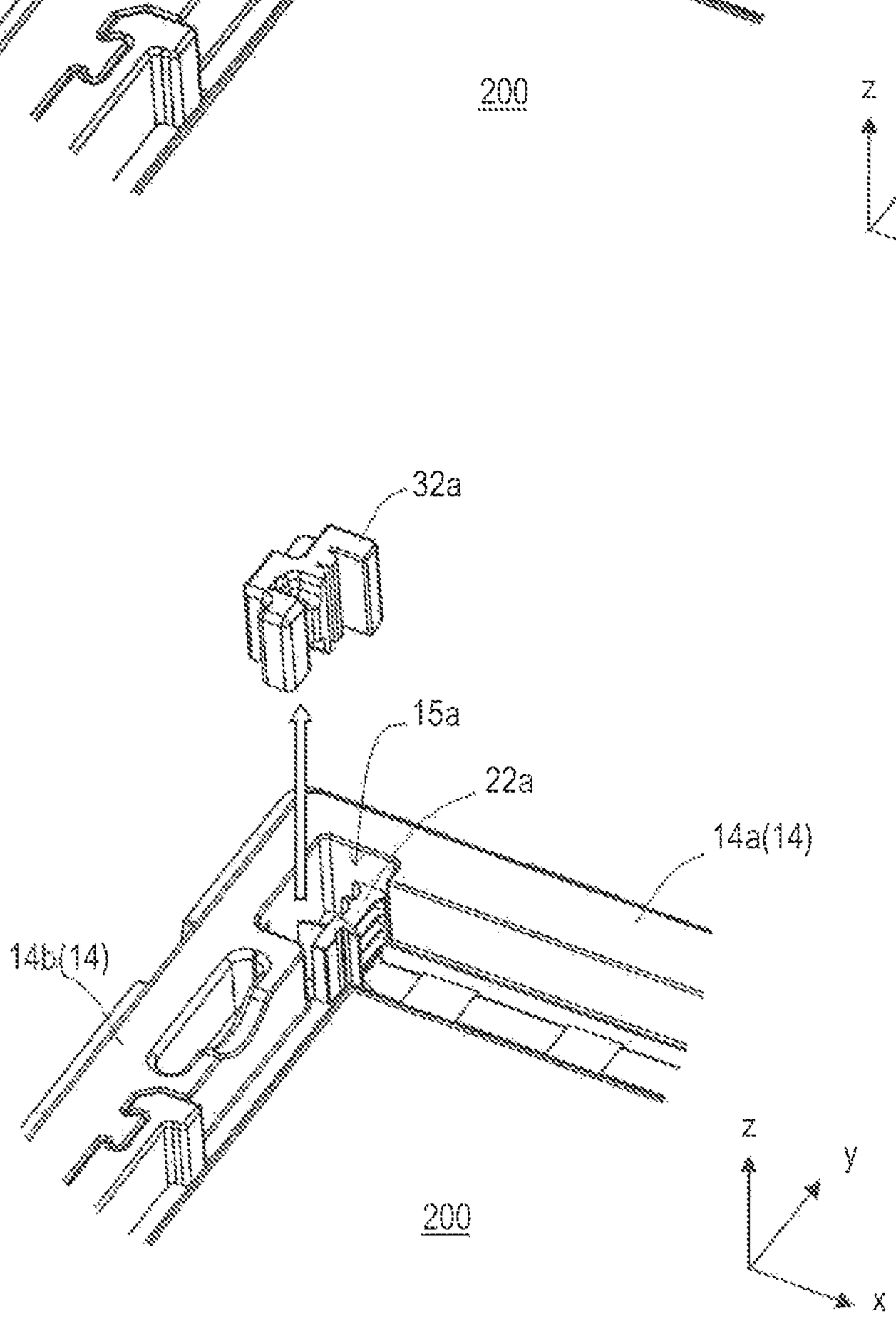
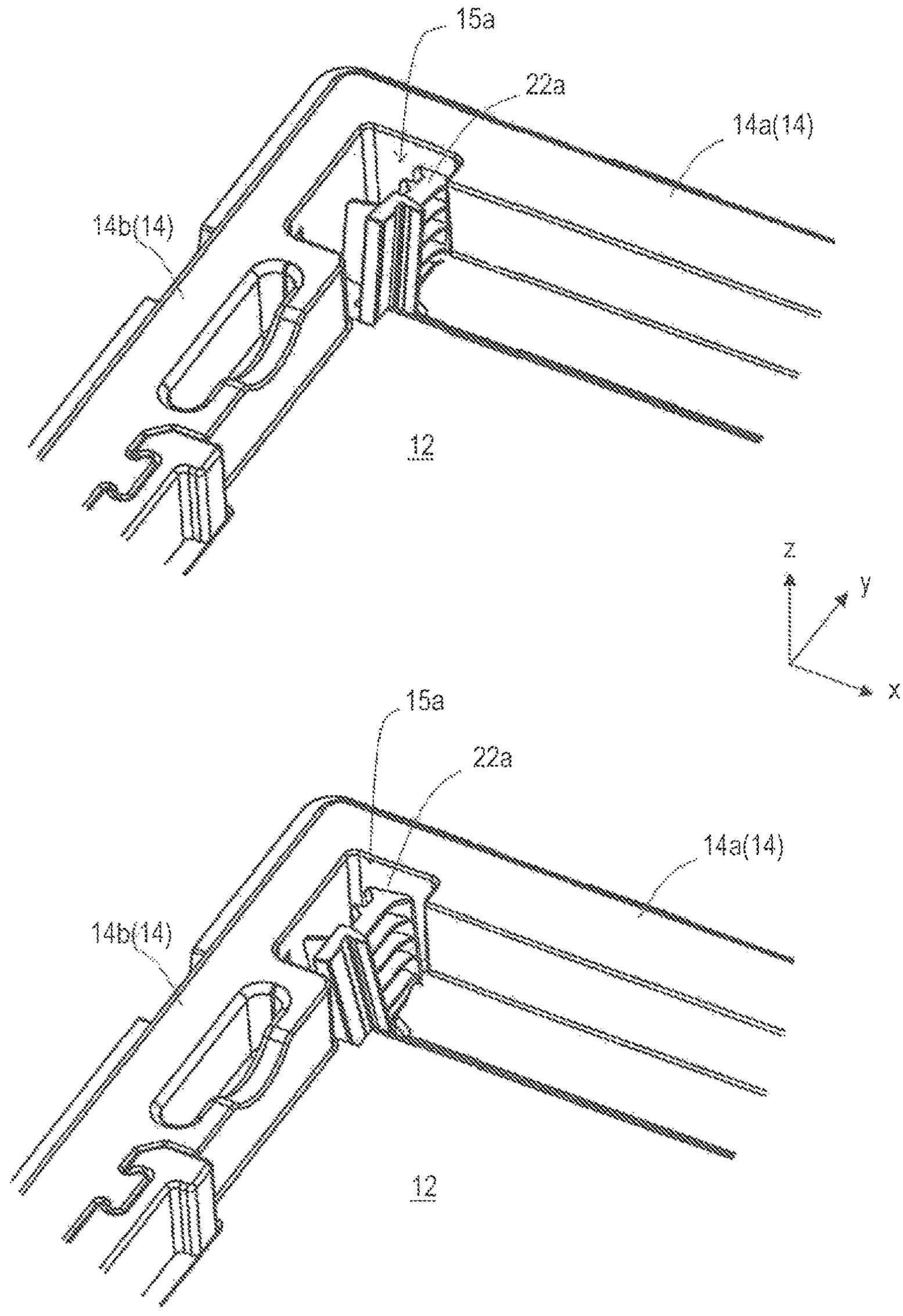

15a
22a
14a(14)
14b(14)
200
z
y
x

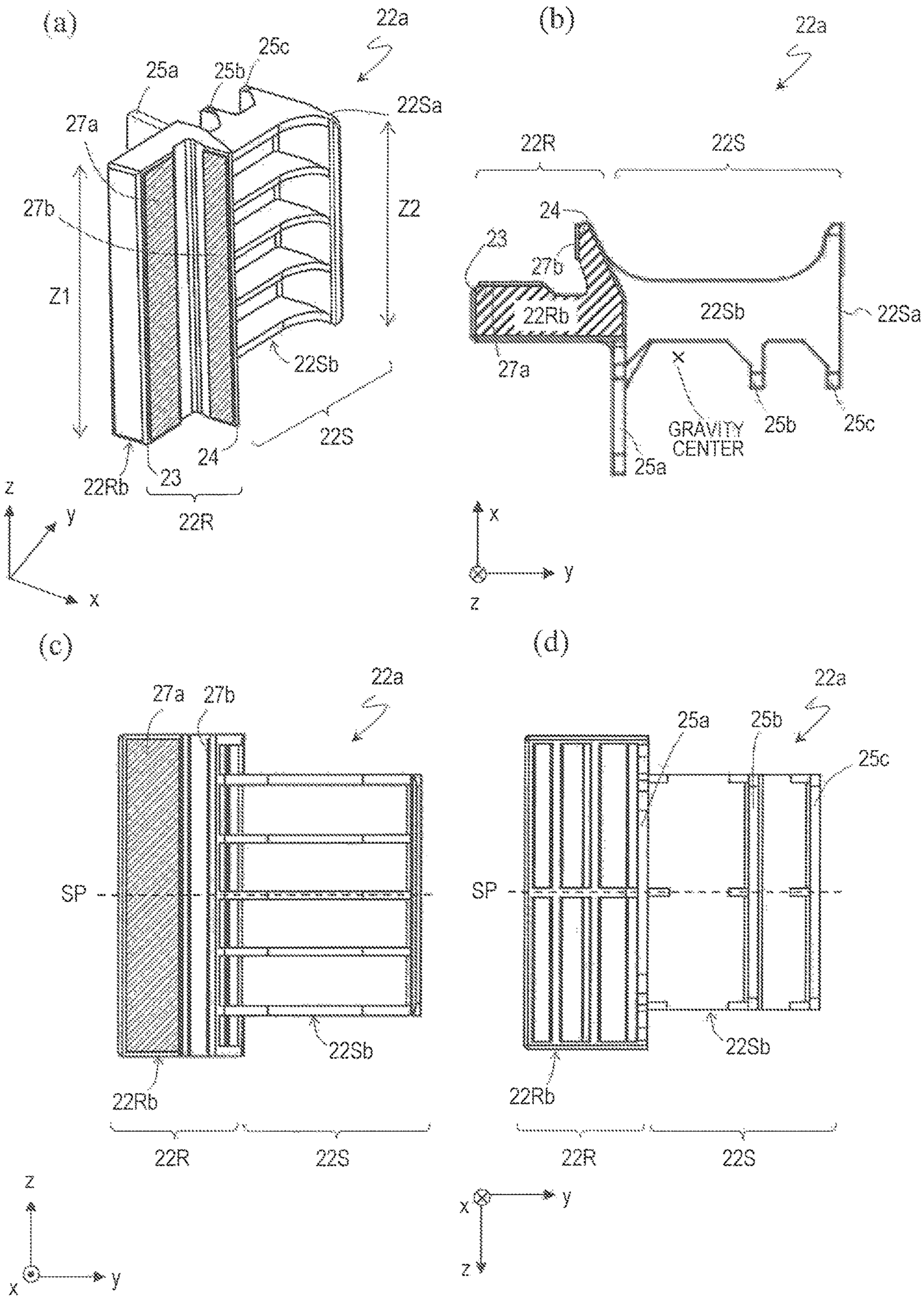
FIG. 3

(a)



(b)

FIG. 4


(a)
22a
25c
25a
25b
22Sa
27a
27b
Z1
Z2
22Sb
22S
24
22Rb
23
22R
z
y
x
(b)
22a
22R
22S
24
23
27b
22Rb
22Sb
22Sa
27a
X
GRAVITY CENTER
25b
25c
25a
x
y
z
(c)
22a
27a
27b
SP
22Sb
22Rb
22R
22S
z
x
y
(d)
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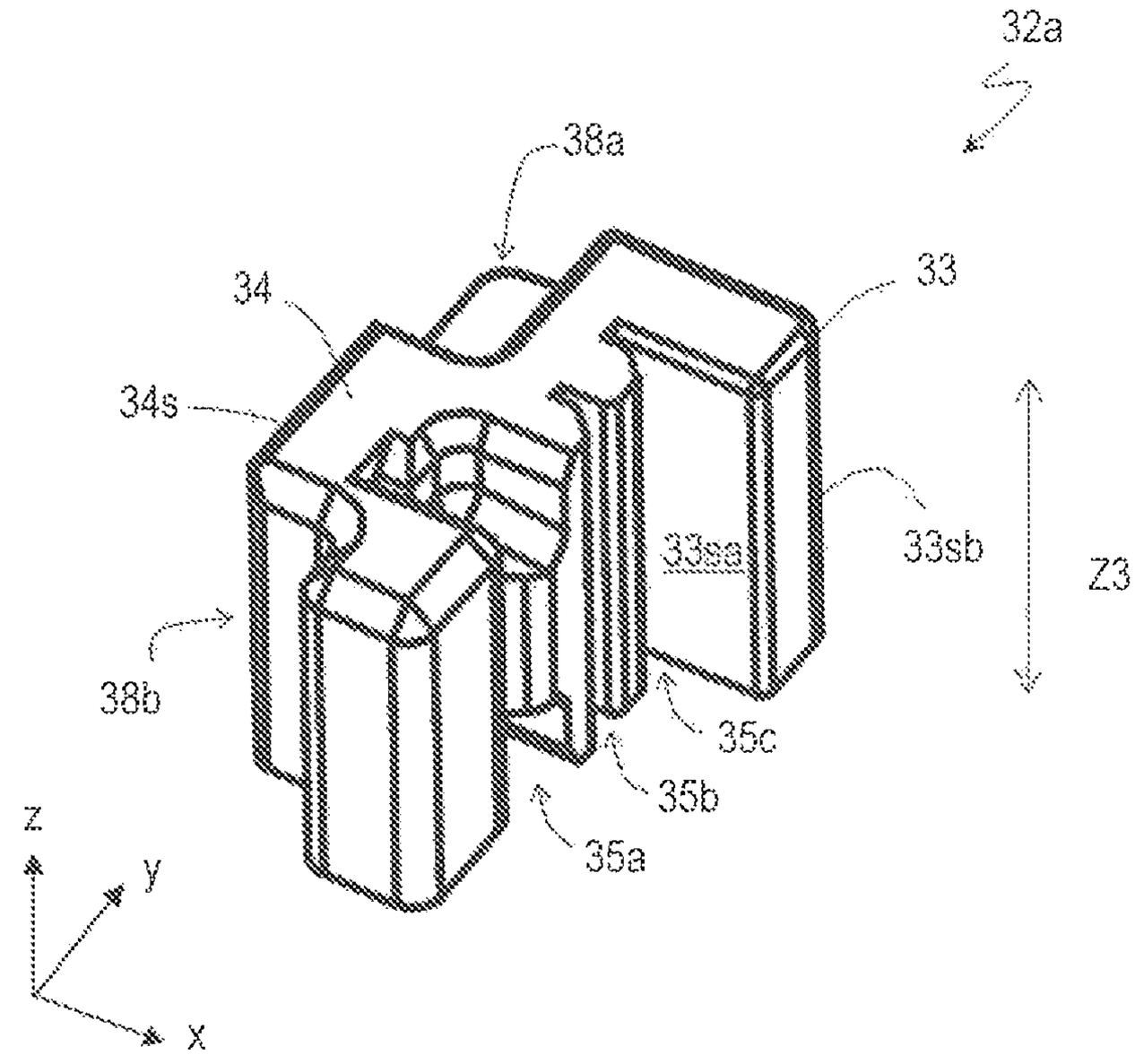
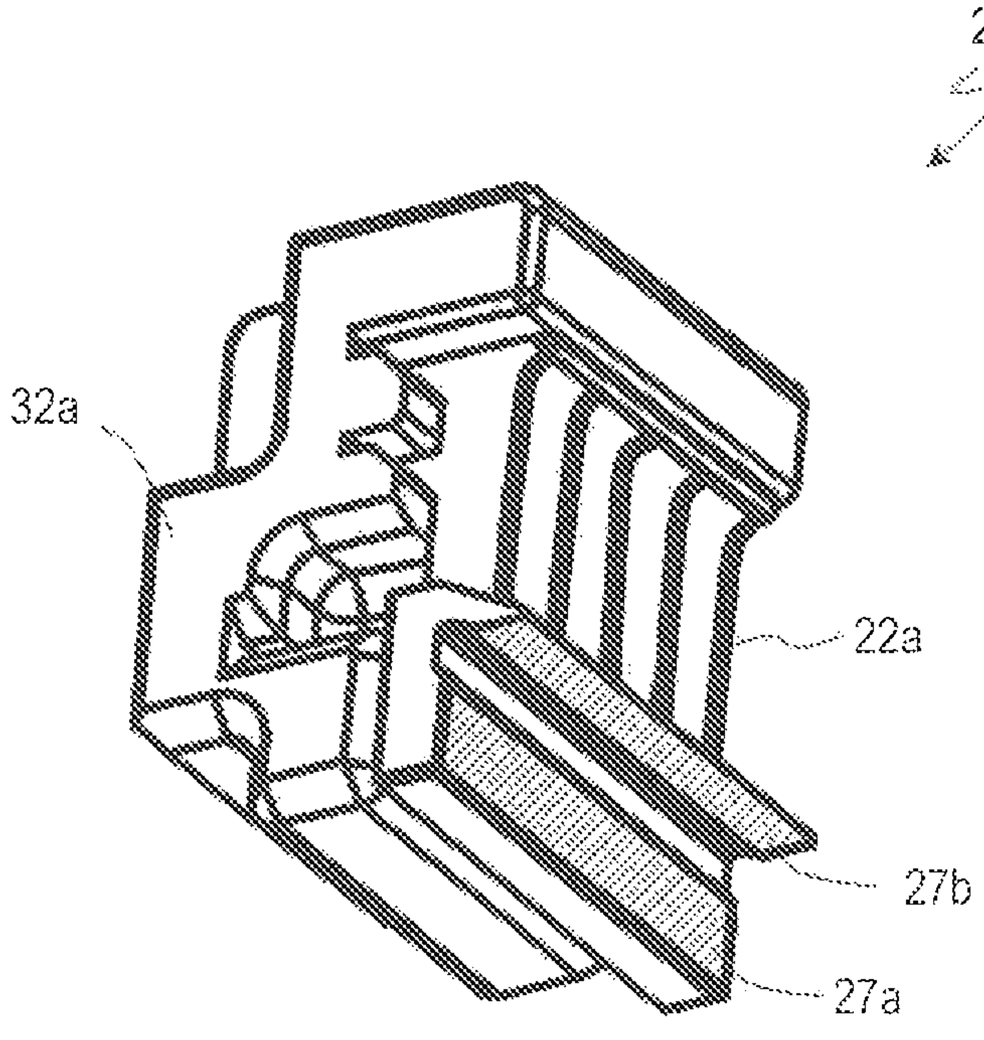
22Rb
22R
22S
x
y
z

FIG. 5

(a)


32a
38a
34
33
34s
33sa
33sb
Z3
38b
35c
35b
35a
z
y
x

(b)


20a
32a
22a
27b
27a

CONTAINER

TECHNICAL FIELD

The present invention relates a container, for example, a container preferably usable to transport an object accommodated therein.

BACKGROUND ART

For example, Patent Document No. 1 discloses a packaging member (i.e., container) usable to transport a display panel. The container disclosed in Patent Document No. 1 includes a corner protection member provided at a corner of a recessed portion that accommodates the display panel. The corner protection member is detachably fittable to a main body of the container and protects a corner of the display panel, which is an object to be accommodated. According to Patent Document No. 1, use of the corner protection member allows a common container main body and a common lid to be used regardless of whether a display panel having a circuit board connected therewith (hereinafter, may be referred to as a "display panel module") is to be accommodated or only a display panel is to be accommodated.

CITATION LIST

Patent Literature

Patent Document No. 1: Japanese Laid-Open Patent Publication No. 2014-9020

SUMMARY OF INVENTION

Technical Problem

However, in the case where the container described in Patent Document No. 1 is used, there are cases where during the removal of the display panel (or the display panel module) from the container, the corner of the display panel is stuck with the corner protection member, and in some cases, the display panel is broken. Or, an attempt to prevent the breakage occasionally results in a decrease in the efficiency of the work of removing the display panel. For example, there is a problem that it is difficult to automatically remove the display panel by use of a robot.

In the above, the container for the display panel is described. However, the problems that an accommodated object is broken as a result of contacting the container, and that an attempt to prevent the breakage decreases the working efficiency, during the removal of the accommodated object, are not limited to occurring in the case of a display panel.

The present invention has an object of providing a container capable of suppressing breakage of an accommodated object, and suppressing a decrease in the working efficiency, during the removal of an accommodated object.

Solution to Problem

A container according to an embodiment of the present invention includes an accommodation member including a bottom surface member defining a bottom surface of an accommodation space and a side surface member defining a side surface of the accommodation space; and at least one protection member located in the accommodation space and having at least one receiving surface to be in contact with an object to be accommodated in the accommodation space. The side surface member includes at least one cutout portion facing the accommodation space. The at least one protection member includes an inner member including a receiving portion having the at least one receiving surface and also includes an outer member located between the inner member and the side surface member and fit to the inner member so as to be slidable in a certain direction crossing the bottom surface. The inner member and the outer member included in the at least one protection member are located in the at least one cutout portion so as to be detachable in the certain direction independently. In a state where the outer member is detached, at least a part of the inner member is retractable into a space in which the outer member was present before being detached.

In an embodiment, in a state where the outer member is detached, the inner member falls toward the space in which the outer member was present before being detached.

In an embodiment, the bottom surface member defines an xy plane, the side surface member defines an xz plane and a yz plane both perpendicular to the xy plane, and the accommodation space has four corners. The at least one cutout portion includes cutout portions respectively facing at least two adjacent corners among the four corners of the accommodation space. The at least one protection member includes protection members respectively located in the cutout portions respectively facing the at least two adjacent corners. The at least one receiving surface includes two receiving surfaces respectively parallel to the xz plane and the yz plane. The outer member is fit to the inner member so as to be slidable in a z direction.

In an embodiment, the inner member includes a plurality of ribs parallel to the xz plane, and the outer member includes a plurality of grooves parallel to the xz plane.

In an embodiment, the receiving portion of the inner member has a bottom surface in contact with the bottom surface member and parallel to the xy plane. The inner member further includes a support portion formed adjacent to the receiving portion in a y direction and having a support surface parallel to the xz plane. The support surface is in contact with a surface, of the outer member, parallel to the xz plane. A bottom surface, of the support portion, facing the bottom surface member and parallel to the xy plane is not in contact with the bottom surface member.

In an embodiment, a length of the receiving portion in the z direction is longer than a length of the support portion in the z direction.

In an embodiment, the center of gravity of the inner member is present outer, to the bottom surface of the receiving portion as seen in the z direction. The center of gravity of the inner member may be shifted in an x direction, the y direction or both of the x direction and the y direction from the bottom surface of the receiving portion, as seen in the z direction.

In an embodiment, the inner member is formed of a non-expanded plastic material, and the outer member is formed of an expanded plastic material.

In an embodiment, the container further includes a protection sheet provided on each of the two receiving surfaces of the inner member. The protection sheet is formed of a non-expanded plastic material harder than the non-expanded plastic material of the inner member.

In an embodiment, the accommodation member is formed of an expanded plastic material as hard as the expanded plastic material of the outer member or an expanded plastic material softer than the expanded plastic material of the outer member.

In an embodiment, the inner member and the outer member each have a plane of symmetry parallel to the xy plane.

Advantageous Effects of Invention

According to an embodiment of the present invention provides a container capable of suppressing breakage of an accommodated object, and suppressing a decrease in the working efficiency, during the removal of an accommodated object.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1**(*a*) is a schematic perspective view of a container **100** according to an embodiment of the present invention, and

FIG. **1**(*b*) is a schematic perspective view of a liquid crystal display panel module **200** to be accommodated in the container **100**.

FIG. **2**(*a*) is a schematic perspective view showing a state where a protection member **20***a* is attached to a cutout portion **15***a* of an accommodation member **10** of the container **100**, and FIG. **2**(*b*) is a schematic perspective view showing a state where an outer member **32***a* of the protection member **20***a* is detached.

FIG. **3**(*a*) is a schematic perspective view showing a state where an inner member **22***a* of the protection member **20***a* falls in a y direction, and FIG. **3**(*b*) is a schematic perspective view showing a state where the inner member **22***a* of the protection member **20***a* fails in a −x direction.

FIG. **4**(*a*) is a schematic perspective view of the inner member **22***a*, FIG. **4**(*b*) is a schematic plan view of the inner member **22***a* as seen in a z direction, FIG. **4**(*c*) is a schematic plan view of the inner member **22***a* as seen the −x direction, and FIG. **4**(*d*) is a schematic plan view of the inner member **22***a* as seen an x direction.

FIG. **5**(*a*) is a schematic perspective view of the outer member **32***a*, and FIG. **5**(*b*) is a schematic perspective view of the protection member **20***a* including the outer member **32***a* and the inner member **22***a* fit to each other.

DESCRIPTION OF EMBODIMENTS

Hereinafter, a container according to an embodiment of the present invention will be described with reference to the drawings. In the following, a container that accommodates a liquid crystal display panel module will be described as an example, An embodiment of the present invention is not limited to the following example. It should be noted that an embodiment of the present invention is directed to a container preferably usable to accommodate an object, like a liquid crystal display panel module, that cannot be supported by four sides but needs to be supported at corners and is formed of a material that is easily cracked or chipped away (glass or a plastic material). An embodiment of the present invention is especially directed to a container preferably usable to transport a liquid crystal display panel module.

FIG. **1**(*a*) is a schematic perspective view of a container **100** according to an embodiment of the present invention. FIG. **1**(*b*) is a schematic perspective view of a liquid crystal display panel module (hereinafter, referred to as the "panel module") **200**, which is to be accommodated in the container **100**.

The container **100** includes an accommodation member **10** including a bottom surface member **12** defining a bottom surface of an accommodation space **10***s* and side surface members **14** (**14***a*, **14***b*, **14***c* and **14***d*) defining side surfaces of the accommodation space IQs, and also includes protection members **20***a*, **20***b*, **20***c* and **20***d* located in the accommodation space **10***s* and having receiving surfaces to be in contact with an object to be accommodated in the accommodation space IDs. The accommodation space **10***s* has four corners. The side surface members **14** respectively include cutout portions **15***a*, **15***b*, **15***c* and **15***d* facing the four corners. The protection members **20***a*, **20***b*, **20***c* and **20***d* are respectively located in the cutout portions **15***a*, **15***b*, **15***c* and **15***d*. A lid **70** is optional and may be omitted. The bottom surface member **12** defines an xy plane, and the side surface members **14** define an kz plane and a yz plane both perpendicular to the xy plane.

In this example, four protection members **20***a*, **20***b*, **20***c* and **20***d* are respectively located at the four corners of the accommodation space **10***s*. In the case where a circuit board **204** is mounted on only one side of a liquid crystal display panel (hereinafter, referred to as the "panel") **202**, like in the case of the panel module **200**, only the cutout portions **15***a* and **15***b* facing at least two adjacent corners, among the four corners, may be provided and the protection members **20***a* and **20***b* may be located only in the cutout portions **15***a* and **15***b*, Instead of the cutout portions **15***c* and **15***d*, a protection member that supports, for example, a side of the panel **202** may be located. In the case where the object to be accommodated is not quadrangular (encompassing rectangular and square), for example, in the case where the object to be accommodated has a polygonal shape having five or more sides and corners such as a pentagonal shape or the like, cutout portions respectively facing the corners of the object may be provided and protection members may be respectively located in the cutout portions, for example. An angle made by two receiving surfaces of each of the protection members is appropriately changed in accordance with the shape of the corners of the object.

The panel module **200** is located in the accommodation space **10***s* of the container **100**. A plurality of (e.g., 10 to 20) panel modules **200** may be located in a stacked manner. A cushioning sheet (e.g., expanded polyethylene CEPE) sheet; thickness: for example, 1 mm) may be held between the panel modules **200**. It is preferred that the cushioning sheet is smaller by several millimeters to about 10 mm than an outer shape of the panel **202**. Another container **100** may be stacked on the container **100** accommodating the panel module(s) **200**. It is preferred that a bottom surface of each of the side surface members **14** of the container **100** has a stepped portion (not shown) engageable with a stepped portion **14***s* provided at a top surface of the corresponding side surface member **14**. It is preferred that a bottom surface of the lid **70** has stepped portions (not shown) engageable with the stepped portions **14***s* provided at the top surfaces of the side surface members **14**.

Now, FIG. **2** will be referred to. FIG. **2**(*a*) is a schematic perspective view showing a state where the protection member **20***a* is attached to the cutout portion **15***a* of the accommodation member **10** of the container **100**. FIG. **2**(*b*) is a schematic perspective view showing a state where an outer member **32***a* of the protection member **20***a* is detached. The protection members **20***b*, **20***c* and **20***d* each have an equivalent structure as that of the protection member **20***a*. Thus, the protection member **20***a* will be described as an example, hereinafter.

The protection member **20***a* includes an inner member **22***a* having receiving surfaces to be in contact with the panel module **200**, and the outer member **32***a* located between the inner member **22***a* and the side surface members **14** (**14***a* and

14*b*). The outer member **32***a* is fit to the inner member **22***a* so as to be slidable in a z direction. The inner member **22***a* and the outer member **32***a* are located in the cutout portion **15***a* while being detachable in the z direction independently.

The protection member **20***a* has a generally parallelepiped shape as a whole. The outer member **32***a* has side surfaces parallel to the xz plane and the yz plane and a top surface and a bottom surface both parallel to the xy plane (side surface **33***sb* and side surface **34***s* shown in FIG. **3**(*a*)). The outer member **32***a* is located in the cutout portion **15***a* such that the side surfaces of the outer member **32***a* that are parallel to the xz plane and the yz plane are in contact with side surfaces of the cutout portion **15***a* that are parallel to the xz plane and the yz plane.

The inner member **22***a* is fittable to the outer member **32***a*. While the inner member **22***a* is located in the cutout portion **15***a*, two receiving surfaces of the inner member **22***a* are parallel to the xz plane and the yz plane and are in contact with a corner of the panel module **200** (panel **202**), and the inner member **22***a* holds the panel module **200** together with the inner members of the other three protection members **20***b*, **20***c* and **20***d* so as not to move the panel module **200** in the xy plane. As shown in FIG. **2**(*b*), when the outer member **32***a* is slid in the z direction to be detached from the cutout portion **15***a*, a space into which at least a part of the inner member **22***a* may be retracted is formed in an area of the cutout portion **15***a* where the outer member **32***a* was present before being detached.

In this example, as a structure that allows at least a part of the inner member **22***a* to be retracted into the space where the outer member **32***a* was present before being detached, a structure that when the outer member **32***a* is detached, allows the inner member **22***a* to fall toward the space where the outer member **32***a* was present before being detached will be described. The inner member **22***a* in this example cannot stand itself in a state where the two receiving surfaces are parallel to the z direction, and fall in a direction away from the panel module **200**. Therefore, the inner member **22***a* fall toward the space where the outer member **32***a* was present before being detached. The inner member **22***a* may be set to fall in a y direction as shown in FIG. **3**(*a*) or may be set to fall in a −x direction as shown in FIG. **3**(*b*). Needless to say, the inner member **22***a* may be set to fall either in the −x direction or in the y direction.

In FIG. **3**(*a*) and FIG. **3**(*b*), a recessed portion or the like formed in the side surface member **14** (**14***b*) is provided in order to decrease the weight of the side surface member **14** and/or the amount of the material of the side surface member **14**. Such a technique is well known in the field of plastic processing, and thus will not be described herein.

When the inner member **22***a* falls in a direction away from the panel module **200** as described above, a sufficiently large gap is formed between the panel module **200** and the inner member **22***a*. Therefore, during the removal of the panel module **200** from the accommodation space **10***s*, the corner of the panel module **200** (panel **202**) is suppressed from contacting the inner member **22***a*. In addition, there is no component that supports the inner member **22***a*. Therefore, even if the inner member **22***a* does not fall in a direction away from the panel module **200** for some reason and as a result, the panel module **200** contacts the inner member **22***a*, no force that may break the panel module **200** is applied to the panel, module **200**. With such a structure, during the removal of the panel module **200**, the problem does not occur that the panel module **200** is broken as a result of contacting the inner member **22***a*, or that the working efficiency is decreased by an attempt to prevent the breakage. For example, a robot may be used to automatically remove the panel module **200** from the container **100**.

In a state where the protection member **20***a* is attached to the cutout portion **15***a*, it is preferred that the clearance between the above-described side surfaces of the outer member **32***a* and the above-described side surfaces of the cutout portion **15***a* is small. For example, the side surfaces of the outer member **32***a* and the side surfaces of the cutout portion **15***a* may be in contact with each other as long as the outer member **32***a* is easily detached from the cutout portion **15***a* while being nipped by a hand of a user. The clearance between one of the receiving surfaces of the inner member **22***a* and the panel module **200** is, for example, about 1 mm to about 3 mm in the case where, for example, the panel module **200** is of a 60-inch type. The clearances may be set to be small as described above, so that the panel module **200** is suppressed from moving in a plane parallel to the xy plane while being transported. In addition, the protection member **20***a* includes the inner member **22***a* and the outer member **32***a* separable from each other. Therefore, even if, for example, a large acceleration is caused to the panel module **200** in the xy plane by sudden braking or the like during the transportation and as a result, a large impact is applied to the receiving surfaces, the protection member **20***a* exhibits a larger effect of absorbing the impact than in the case of being of a single member.

Now, with reference to FIG. **4**(*a*) through FIG. **4**(*d*), FIG. **5**(*a*) and FIG. **5**(*b*), an example of the inner member **22***a* and the outer member **32***a* will be described in detail. FIG. **4**(*a*) is a schematic perspective view of the inner member **22***a*. FIG. **4**(*b*) is a schematic plan view cf the inner member **22***a* as seen in the z direction. FIG. **4**(*c*) is a schematic plan view of the inner member **22***a* as seen the −x direction. FIG. **4**(*d*) is a schematic plan view of the inner member **22***a* as seen an x direction. FIG. **3**(*a*) is a schematic perspective view of the outer member **32***a*. FIG. **5**(*b*) is a schematic perspective view of the protection member **20***a* including the outer member **32***a* and the inner member **22***a* fit to each other.

As shown, in FIG. **4**(*a*), the inner member **22***a* includes a receiving portion **22**R having receiving surfaces **23** and **24**, and a support portion **223** formed adjacent to the receiving portion **22**R in the y direction and having a support surface **22**Sa parallel to the xz plane. The inner member **22***a* includes a plurality of ribs **25***a*, **25***b* and **25***c* provided in the support portion **22**S and parallel to the xz plane. Optional protection sheets **27***a* and **27***b* are respectively provided on the receiving surfaces **23** and **24**. The protection sheets **27***a* and **27***b* may be omitted.

As shown in FIG. **5**(*a*), the outer member **32***a* includes a plurality of grooves **35***a*, **35***b* and **35***c* parallel to the xz plane. The ribs **25***a*, **25***b* and **25***c* of the inner member **22***a* are respectively inserted into the grooves **35***a*, **35***b* and **35***c* of the outer member **32***a*, and as a result, the inner member **22***a* and the outer member **32***a* are fit to each other. In a state where the inner member **22***a* and the outer member **32***a* are fit to each other, the support surface **22**Sa of the inner member **22***a* is in contact with a surface **33***sa*, of the outer member **32***a*, parallel to the plane (see FIG. **5**(*b*)).

A bottom surface **22**Rb, of the receiving portion **22**R, parallel to the xy plane is in contact with the bottom surface member **12**. By contrast, a bottom surface **22**Sb, of the support portion **22**S, facing the bottom surface member **12** and parallel to the xy plane is not in contact with the bottom surface member **12**. Namely, length Z**1** of the receiving portion **22**R in the z direction is longer than length **22** of the support portion **22**S in the s direction, and only the bottom

surface **22**Rb of the receiving portion **22**R is in contact with the bottom surface member **12**.

As shewn in FIG. **4**(*b*), the inner member **22***a* is structured such that the center of gravity thereof is present outer to the bottom surface **22**Rb of the receiving portion **22**R as seen in the z direction. The center of gravity of the inner member **22***a* may be shifted from the bottom surface **22**Rb of the receiving portion **22**R in the direction, in the y direction, or both of the −x direction and the y direction as seen in the x direction. Since the center of gravity of the inner member **22***a* is shifted from the bottom surface **22**Rb of the receiving portion **22**R as described above, the inner member **22***b* cannot stand itself on the bottom surface member **12** and falls in a direction in which the center of gravity thereof is shifted.

The center of gravity of the inner member **22***a* may be adjusted by, for example, the shape of the support portion **22**S. For example, the rib **25***a* may be protruded to be inserted deep into the groove **35***a* of the outer member **32***a*, so that the center of gravity of the inner member **22***a* is shifted in the direction.

The structure to cause the inner member **22***a* to fall in the −x direction or in the y direction may be modified in any of various manners. For example, a protrusion may be provided on the bottom surface **22**Rb of the receiving portion **22**R. Even with the structure in which the protrusion is provided on the bottom surface **22**Rb, the receiving surfaces **23** and **24** may be located to be parallel to the z direction in a state where the inner member **22***a* is fit to the outer member **32***a*.

As shown in FIG. **5**(*a*), the outer member **32***a* has the side surface **33***sb* parallel to the xz plane and the side surface **34***s* parallel to the yz plane. The outer member **32***a* is located, such that the side surface **33***sb* and the side surface **34***s* are respectively in contact with the side surfaces of the cutout portion **15***a* of the side surface members **14** that are parallel to the xz plane and the yz plane, and such that the bottom surface of the outer member **32***a* parallel to the xy plane is in contact with the bottom surface member **12**. A portion **33** of the outer member **32***a* is located between the inner member **22***a* and the side surface member **14***a*, and a portion **34** of the outer member **32***a* is located between the inner member **22***a* and the side surface member **14***b* (see, for example, FIG. **2**(*a*)). The outer member **32***a* supports the receiving surfaces **23** and **24** of the inner member **22***a* such that the receiving surfaces **23** and **24** are parallel to the z direction, and may decrease the impact applied from the inner member **22***a* to the side surface members **14**. The outer member **32***a* does not need to have the bottom surface parallel to the xy plane. A reason for this is that the outer member **32***a* may be located such that the side surface **33***sb* and the side surface **34** are parallel to the z direction by contacting the side surfaces of the cutout portion **15***a* of the side surface members **14** that are parallel to the xz plane and the yz plane.

The outer member **32***a* further includes recessed portions **38***a* and **38***b*. The recessed portions **38***a* and **38***b* are provided such that in a state where the outer member **32***a* is located in the cutout portion **15***a*, hollows are formed between the outer member **32***a* and the side surface members **14**. For detaching the outer member **32***a* located in the cutout portion **15***a*, fingertips may be inserted into the hollows formed between the outer member **32***a* and the side surface members **14**, Thus, the outer member **32***a* may be nipped easily with the fingers.

As represented by the dashed line in, for example, FIG. **4**(*c*) and FIG. **4**(*d*), the inner member **22***a* has a plane of symmetry SP parallel to the xy plane. Similarly, the outer member **32***a* has a plane of symmetry parallel to the xy plane. With such a structure, common inner members **22***a* and common outer members **32***a* may be used to form the four protection members **20***a*, **20***b*, **20***c* and **20***d*.

Now, preferred materials for each of the components of the container **100** will be described. The materials described below are preferred examples of materials for the container **100** transporting the panel module **200**, and the preferred materials are not limited to those described below.

The accommodation member **10** (bottom surface member **12** and side surface members **14**), the outer member **32***a* and the inner members **22***a* may all be formed of a plastic material. A plastic material preferably usable for these components is any of various known plastic materials (thermoplastic resins). Examples of the usable plastic material include polyolefins such as polyethylene, polypropylene and the like, polystyrenes, and mixtures (blends) thereof. These plastic materials in an expanded form are also usable.

For the accommodation member **10**, a material having a large effect of absorbing the impact during the transportation is preferred. The accommodation member **10** is preferably formed of an expanded plastic material. For the inner member **22***a*, which directly receives a force from the panel module **200** (panel **202**), a material harder than the material of the outer member **32***a* and the material of the accommodation member **10** is preferred. The inner member **22***a* is preferably formed of a non-expanded plastic material. The protection sheets **27***a* and **27***b* are preferably formed of a non-expanded plastic material harder than the material of the inner member **22***a*. The outer member **32***a*, which is located between the accommodation member **10** and the inner member **22***a*, is preferably formed of a material having a hardness between the hardness of the material of the accommodation member **10** and the hardness of the material of the inner member **22***a*, or a material as hard as the material of the accommodation member **10**, for example, an expanded plastic material.

For example, the inner member **22***a* is formed of, preferably, non-expanded polyethylene, and more preferably, high density polyethylene from the point of view of the hardness. The protection sheets **27***a* and **27***b* are in direct contact with, for example, a glass substrate of the panel module **200** (panel **202**) and therefore, is preferably formed of polycarbonate, which is highly abrasion resistant.

The outer member **32***a* is preferably formed of, for example, expanded polyethylene (EPE) or expanded polypropylene (EPP). Alternatively, an expanded form of a mixture (blend) or polyethylene or polypropylene and polystyrene may be used for the outer member **32***a*. The expansion ratio of these expanded plastic materials is, for example, 10 to 20 times. For example, an expanded form of a mixture (blend) of polyethylene and polystyrene expanded at a ratio of 10 times is preferably usable for the outer member **32***a*.

The accommodation member **10** is preferably formed of expanded polyethylene (EPE), expanded polypropylene (EPP) or expanded polystyrene (EPS, also referred to as "styrofoam"). Among these materials, expanded polystyrene (EPS) is most preferable. It should be noted that in order to transport the panel module **200** more safely, it is especially preferred to use expanded polystyrene expanded at a ratio lower than that of commonly used expanded polystyrene (expansion ratio: about 70 times), for example, expanded polystyrene expanded at a ratio of about 20 times to about 50 times.

The above-described materials have been selected based on results of an impact test. For the impact test, a state where

20 liquid crystal display panel modules (60 inches) are accommodated in the container **100** produced with various materials was simulated. With the above-described materials, the liquid crystal display panel modules may be transported very safely. Namely, the liquid crystal display panel modules may be suppressed from being broken during the transportation. The 60-inch liquid crystal display panel modules used for the test had a size of about 1300 mm×about 800 mm. The container **100** had an outer shape of about 1500 mm ×about 1600 mm to about 900 mm ×about 1000 mm and a height of about 120 mm to about 150 mm. In order to increase the strength, the outer shape of the container **100** may be increased. In order to increase the transportation efficiency and decrease the cost, the outer shape of the container **100** may be decreased. The material of each of the components may be selected from the above-listed materials, and the size of each of the components may be optimized, in accordance with the use.

In the above, the structure of the container **100** according to an embodiment of the present invention is described in the case where the object to be accommodated is a panel module, which is very easily broken. The structure in which the protection member **20***a* includes the inner member **22***a* and the outer member **32***a* and at least a part of the inner member **22***a* is retracted into a space formed by the detachment of the outer member **32***a* is applicable regardless of the shape or the material of the object to be accommodated. Such a structure suppresses breakage of the accommodated object, and also suppresses a decrease in the working efficiency, during the removal of the object.

Namely, a container according to another embodiment of the present invention may include an accommodation member including a bottom surface member defining a bottom surface of an accommodation space and a side surface member defining a side surface of the accommodation space; and at least one protection member located in the accommodation space and having at least one receiving surface to be in contact with an object to be accommodated in the accommodation space. The side surface member may include at least one cutout portion facing the accommodation space. The at least one protection member may include an inner member including a receiving portion having the at least one receiving surface and also include an outer member located between the inner member and the side surface member and fit to the inner member so as to be slidable m a certain direction crossing the bottom surface. The inner member and the outer member included in the at least one protection member may be located in the at least one cutout portion so as to be detachable in the certain direction independently. In a state where the outer member is detached, at least a part of the inner member may be retractable into a space in which the outer member was present before being detached.

As a structure that allows at least a part of the inner member to be retracted into the space where the cuter member was present before being detached, a structure that in a state where the outer member is detached, allows the inner member to fall toward the space where the outer member was present before being detached may be adopted. Such a structure does not require a special work or operation to retract at least a part of the inner member (e.g., movement of the inner member in a plane parallel to the bottom surface). This allows a robot to be used to automatically remove the accommodated object from the container more easily.

INDUSTRIAL APPLICABILITY

An embodiment of the present invention is directed to a container preferably usable to, for example, transport an object accommodated therein.

REFERENCE SIGNS LIST

10 accommodation member
10*s* accommodation space
12 bottom surface member
14, **14***a*, **14***b*, **14***c*, **14***d* side surface, member
14*s* stepped portion
15*a*, **15***b*, **15***c*, **15***d* cutout portion
20*a*, **20***b*, **20***c*, **20***d* protection member
22R receiving portion
22Eb bottom surface
22S support portion
22Sa support surface
22Sb bottom surface
22*a* inner member
23, **24** receiving surface
25*a*, **25***b*, **25***c* rib
32*a* outer member
35*a*, **35***b* groove
70 lid
100 container
200 liquid crystal display panel module
202 liquid crystal display panel
204 circuit board

The invention claimed is:

1. A container, comprising:

an accommodation member including a bottom surface member defining a bottom surface of an accommodation space and a side surface member defining a side surface of the accommodation space; and

at least one protection member located in the accommodation space and having at least one receiving surface to be in contact with an object to be accommodated in the accommodation space,

wherein the side surface member includes at least one cutout portion facing the accommodation space,

wherein the at least one protection member includes an inner member including a receiving portion having the at least one receiving surface and also includes an outer member located between the inner member and the side surface member and fit to the inner member so as to be slidable in a certain direction crossing the bottom surface,

wherein the inner member and the outer member included in the at least one protection member are located in the at least one cutout portion so as to be detachable in the certain direction independently,

wherein in a state where the outer member is detached, at least a part of the inner member is retractable into a space in which the outer member was present before being detached,

wherein the bottom surface member defines an xy plane, the side surface member defines an xz plane and a yz plane both perpendicular to the xy plane, and the accommodation space has four corners,

wherein the at least one cutout portion includes cutout portions respectively facing at least two adjacent corners among the four corners of the accommodation space,

wherein the at least one protection member includes protection members respectively located in the cutout portions respectively facing the at least two adjacent corners,

wherein the at least one receiving surface includes two receiving surfaces respectively parallel to the xz plane and the yz plane,

wherein the outer member is fit to the inner member so as to be slidable in a z direction,

wherein the receiving portion of the inner member has a bottom surface in contact with the bottom surface member and parallel to the xy plane,

wherein the inner member further includes a support portion formed adjacent to the receiving portion in a y direction and having a support surface parallel to the xz plane,

wherein the support surface is in contact with a surface, of the outer member, parallel to the xz plane, and

wherein a bottom surface, of the support portion, facing the bottom surface member and parallel to the xy plane is not in contact with the bottom surface member.

2. The container of claim **1**, wherein in a state where the outer member is detached, the inner member falls toward the space in which the outer member was present before being detached.

3. The container of claim **1**, wherein the inner member includes a plurality of ribs parallel to the xz plane, and the outer member includes a plurality of grooves parallel to the xz plane.

4. The container of claim **1**, wherein a length of the receiving portion in the z direction is longer than a length of the support portion in the z direction.

5. The container of claim **1**, wherein the center of gravity of the inner member is present outer to the bottom surface of the receiving portion as seen in the z direction.

6. The container of claim **1**, wherein the inner member is formed of a non-expanded plastic material, and the outer member is formed of an expanded plastic material.

7. The container of claim **6**, further comprising a protection sheet provided on each of the two receiving surfaces of the inner member, wherein the protection sheet is formed of a non-expanded plastic material harder than the non-expanded plastic material of the inner member.

8. The container of claim **6**, wherein the accommodation member is formed of an expanded plastic material as hard as the expanded plastic material of the outer member or an expanded plastic material softer than the expanded plastic material of the outer member.

9. The container of claim **1**, wherein the inner member and the outer member each have a plane of symmetry parallel to the xy plane.

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